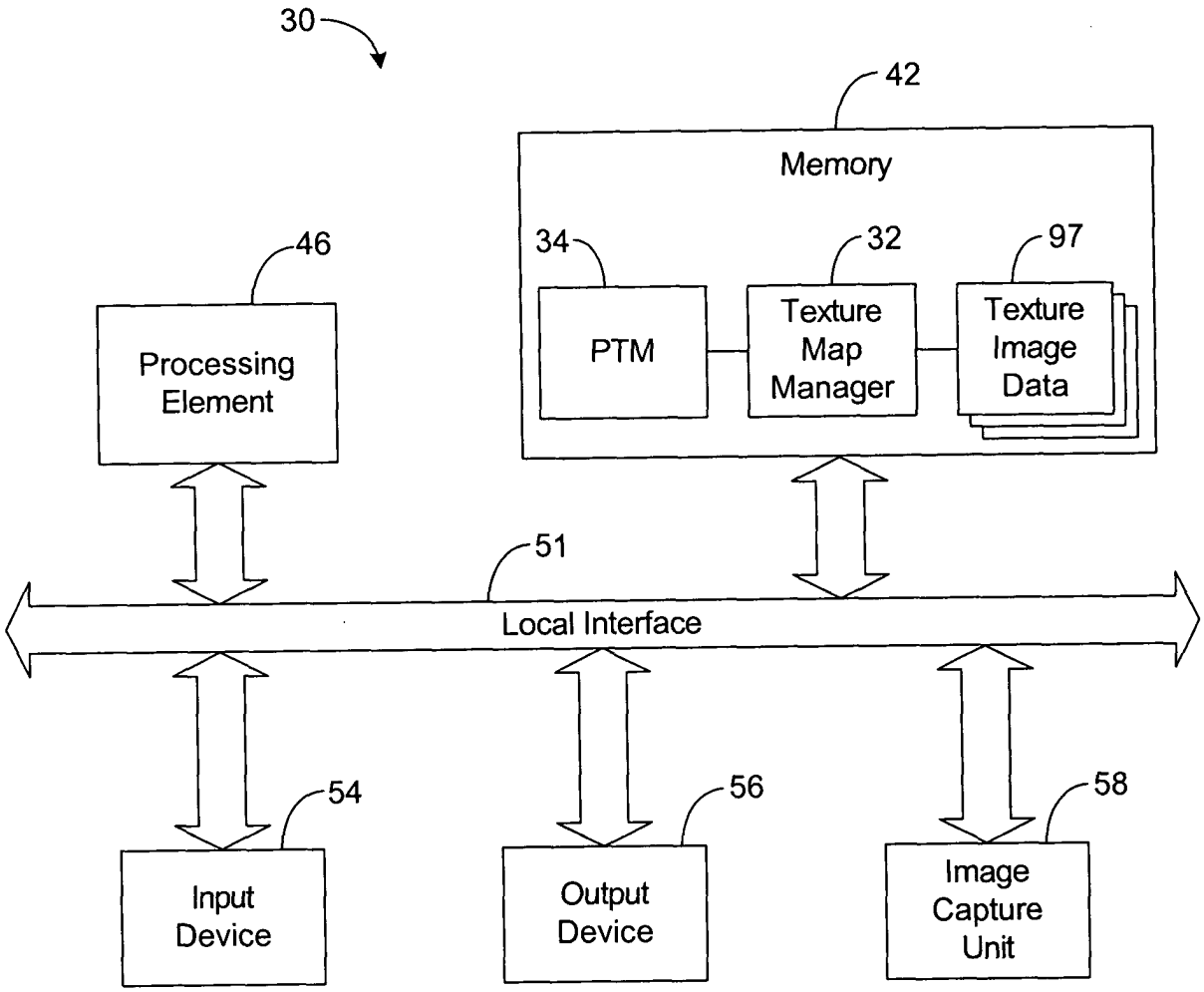
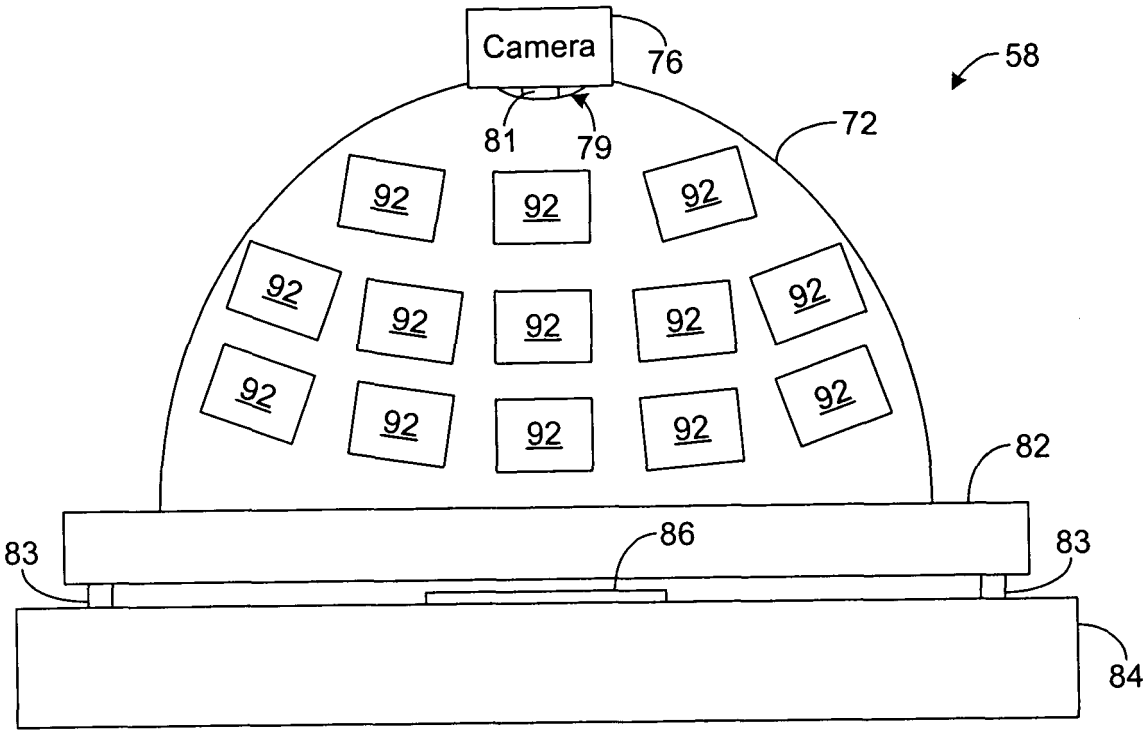
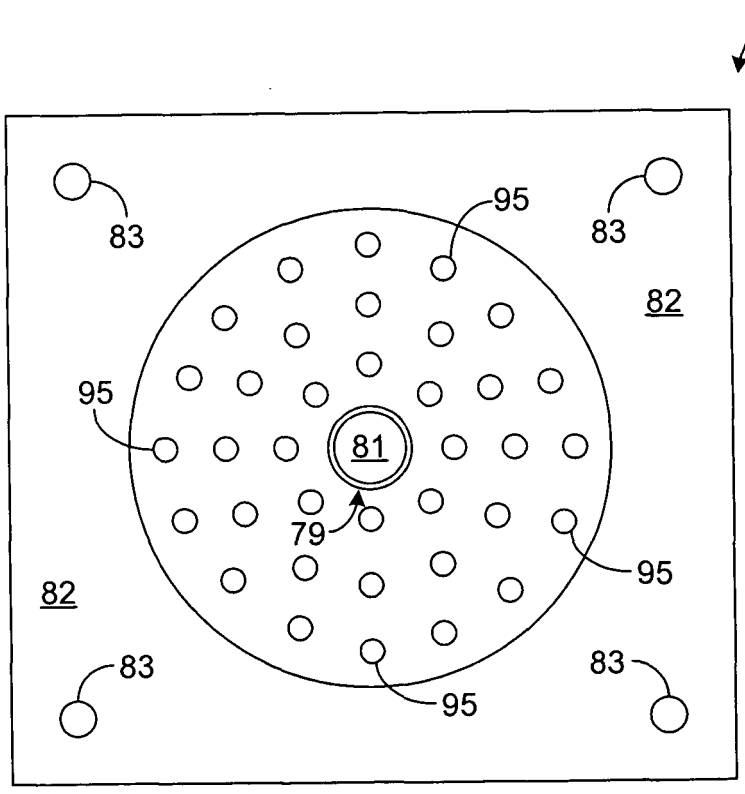

30
42
Memory
34
PTM
32
Texture Map Manager
97
Texture Image Data
46
Processing Element
51
Local Interface
54
Input Device
56
Output Device
58
Image Capture Unit

FIG. 1



(Side View)

FIG. 2



(Bottom View)

FIG. 3

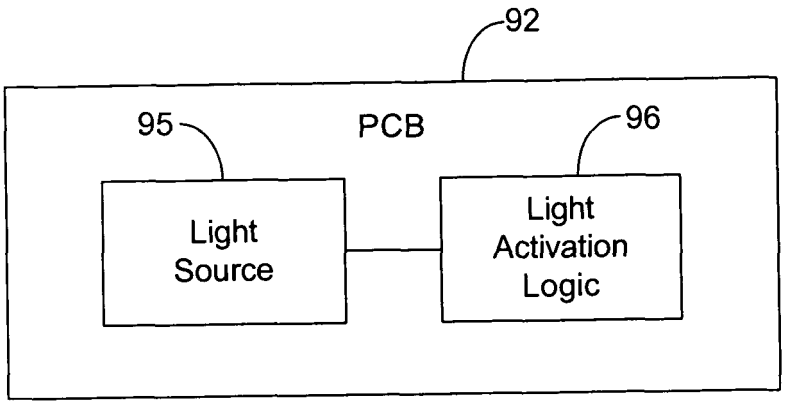

92
95
PCB
96
Light Source
Light Activation Logic

FIG. 4

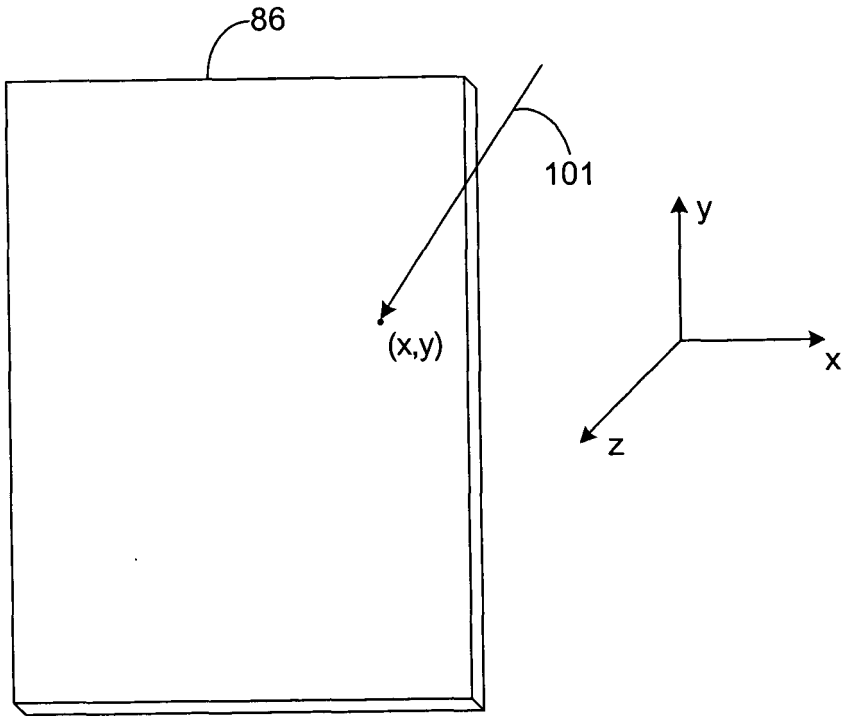
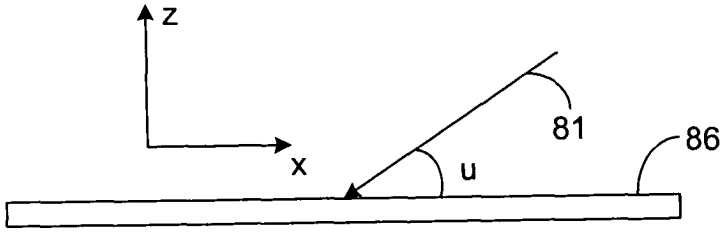
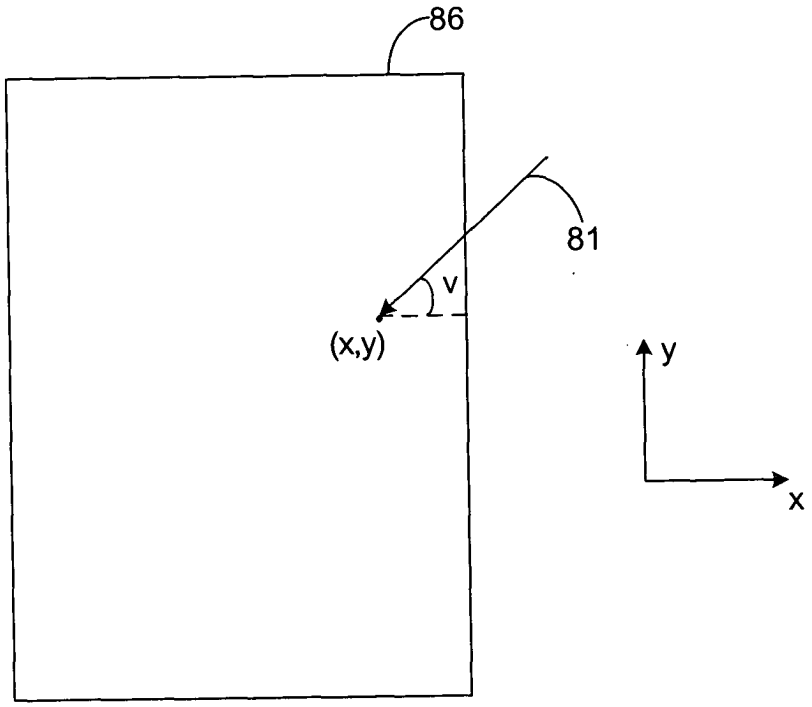

86
101
y
(x,y)
x
z

FIG. 5



(Side View)

FIG. 6



(Top View)

FIG. 7

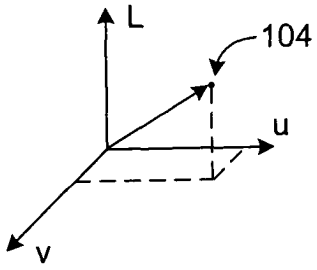


FIG. 8

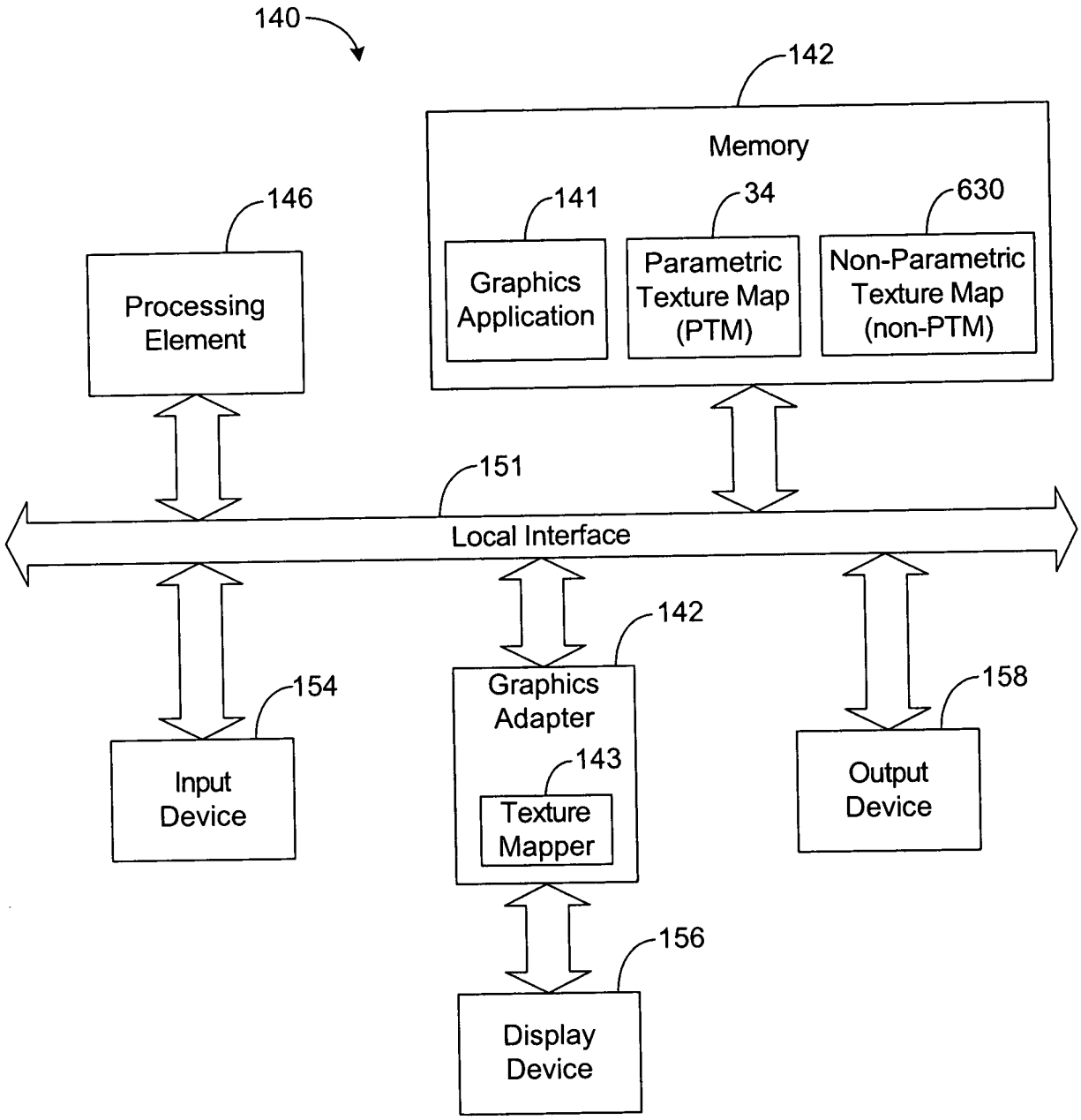

140
142
Memory
146
141
34
630
Processing Element
Graphics Application
Parametric Texture Map (PTM)
Non-Parametric Texture Map (non-PTM)
151
Local Interface
142
154
158
Graphics Adapter
143
Input Device
Texture Mapper
Output Device
156
Display Device

FIG. 9

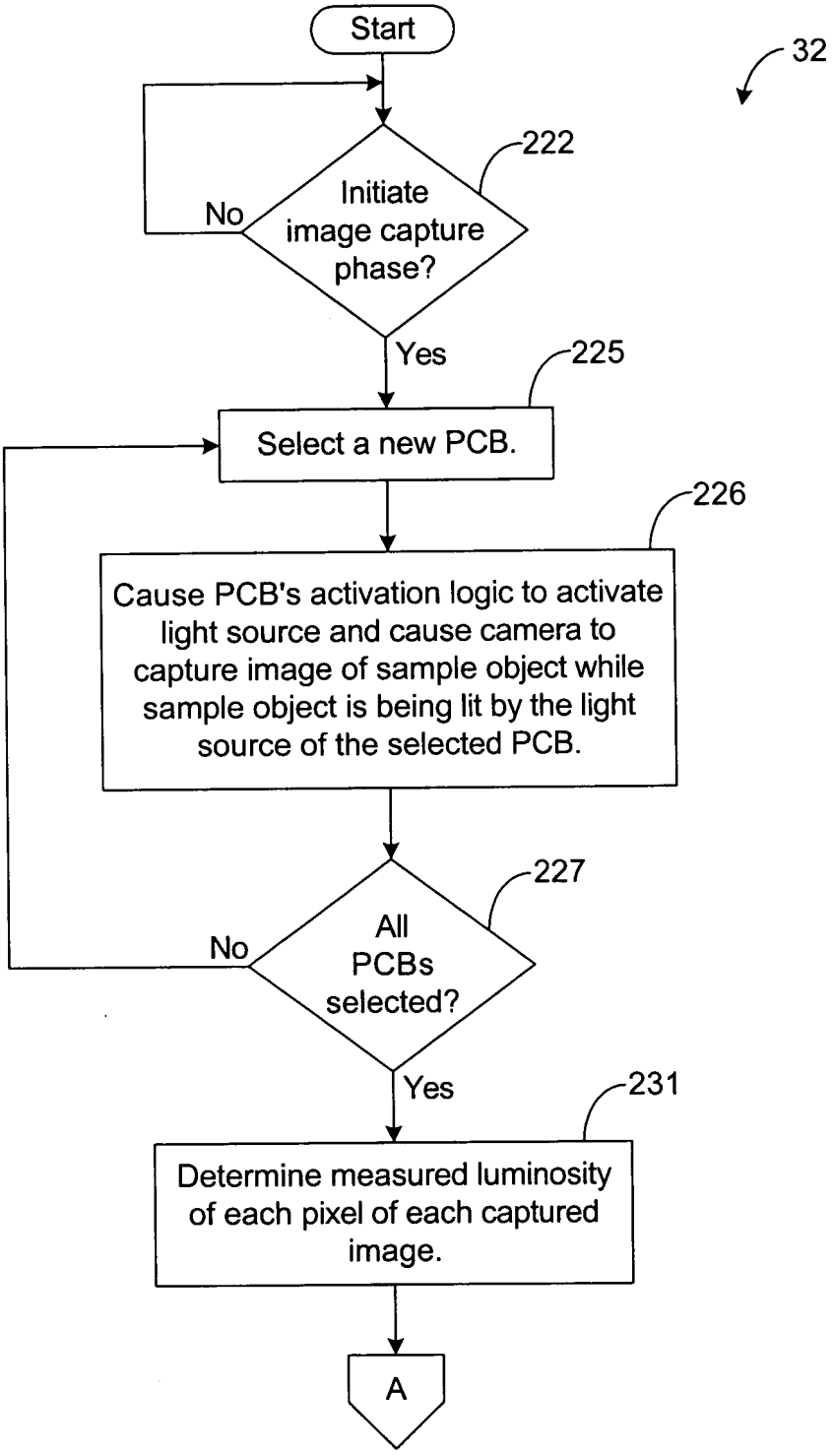

Start
32
222
Initiate image capture phase?
No
Yes
225
Select a new PCB.
226
Cause PCB's activation logic to activate light source and cause camera to capture image of sample object while sample object is being lit by the light source of the selected PCB.
227
All PCBs selected?
No
Yes
231
Determine measured luminosity of each pixel of each captured image.
A

FIG. 10

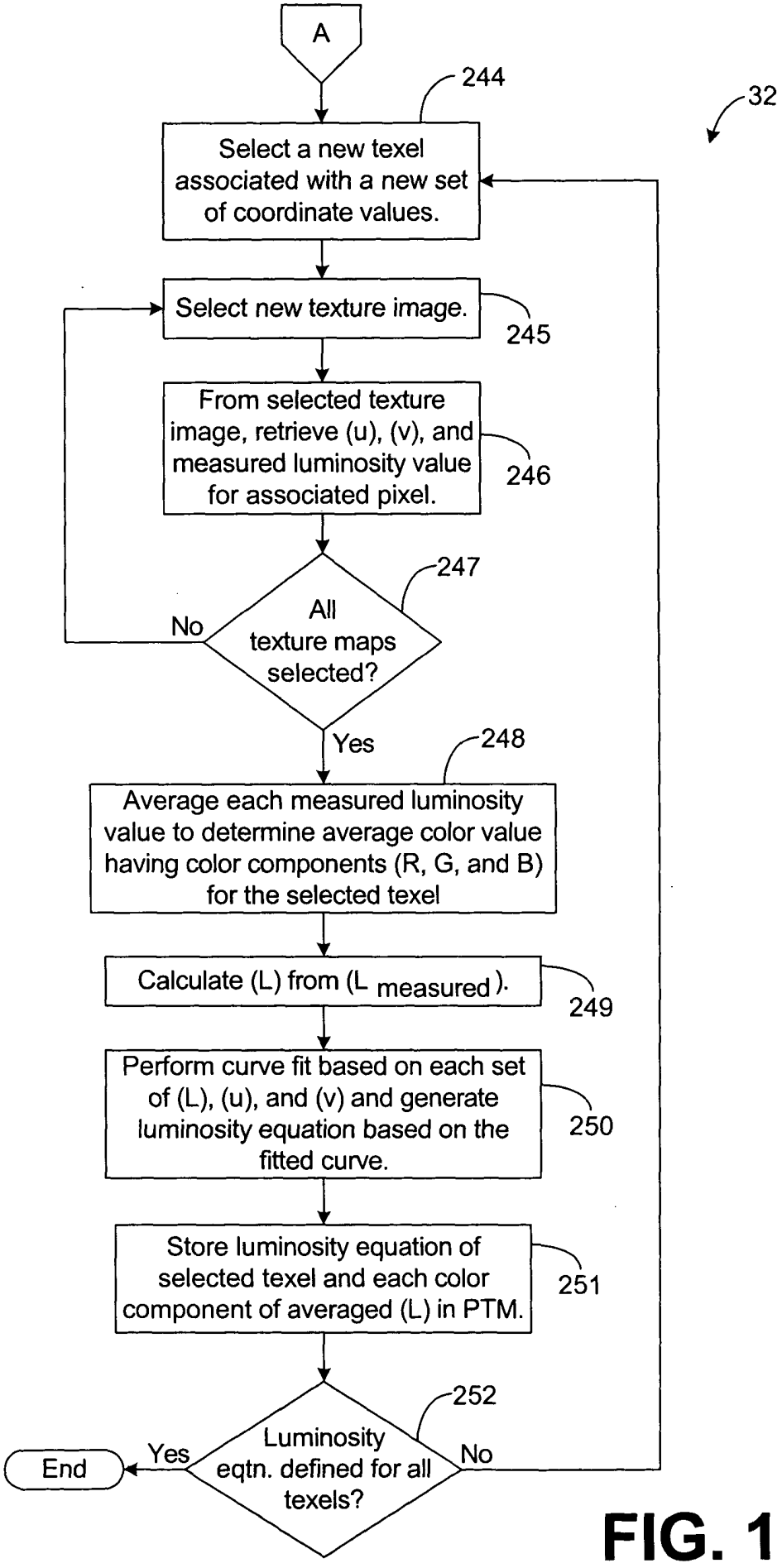

A
244
32
Select a new texel associated with a new set of coordinate values.
Select new texture image.
245
From selected texture image, retrieve (u), (v), and measured luminosity value for associated pixel.
246
247
All texture maps selected?
No
Yes
248
Average each measured luminosity value to determine average color value having color components (R, G, and B) for the selected texel
Calculate (L) from (L measured).
249
Perform curve fit based on each set of (L), (u), and (v) and generate luminosity equation based on the fitted curve.
250
Store luminosity equation of selected texel and each color component of averaged (L) in PTM.
251
252
Luminosity eqtn. defined for all texels?
Yes
No
End

FIG. 11

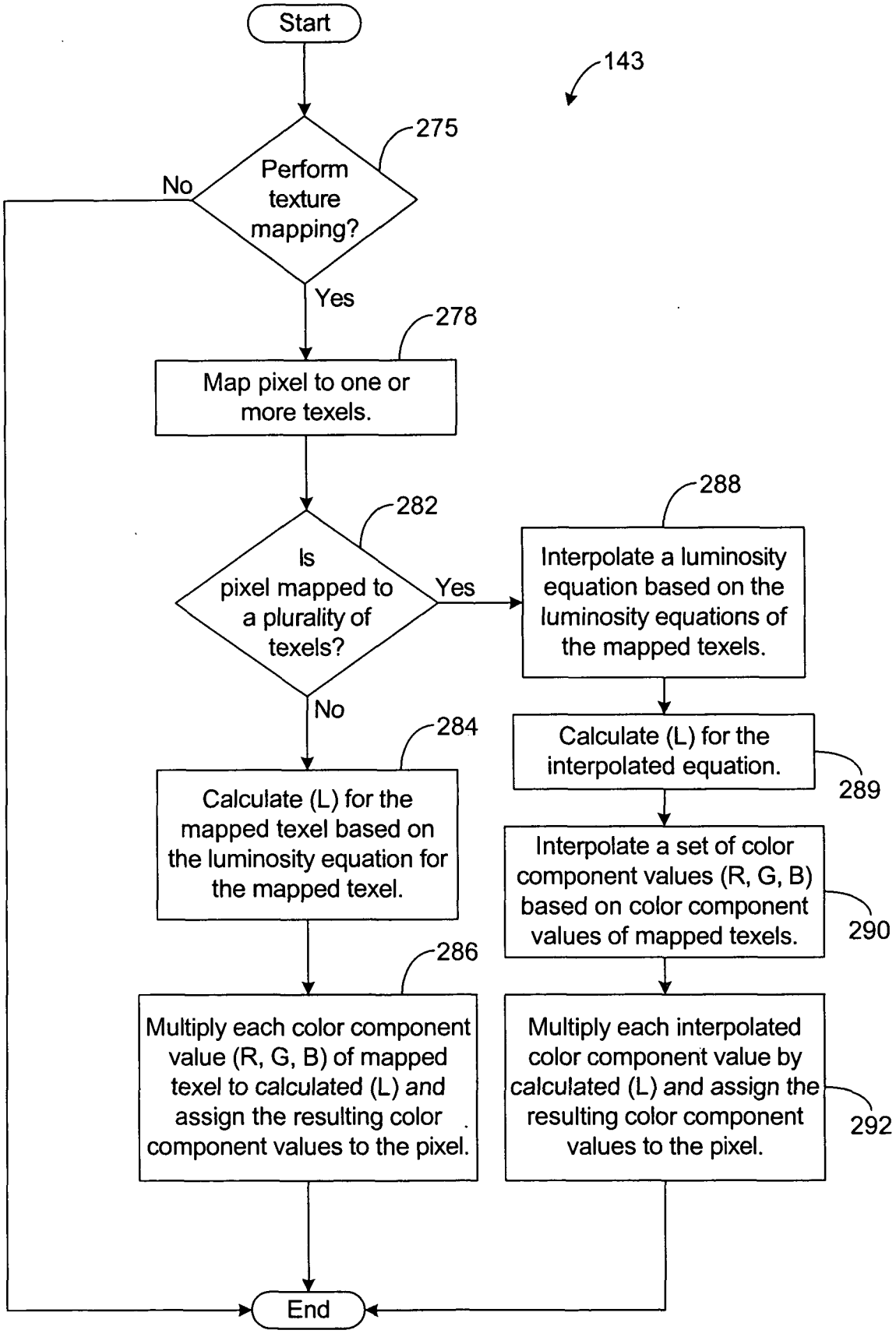

Start
143
275
Perform texture mapping?
No
Yes
278
Map pixel to one or more texels.
282
Is pixel mapped to a plurality of texels?
Yes
No
288
Interpolate a luminosity equation based on the luminosity equations of the mapped texels.
Calculate (L) for the interpolated equation.
289
Interpolate a set of color component values (R, G, B) based on color component values of mapped texels.
290
284
Calculate (L) for the mapped texel based on the luminosity equation for the mapped texel.
286
Multiply each color component value (R, G, B) of mapped texel to calculated (L) and assign the resulting color component values to the pixel.
Multiply each interpolated color component value by calculated (L) and assign the resulting color component values to the pixel.
292
End

FIG. 12

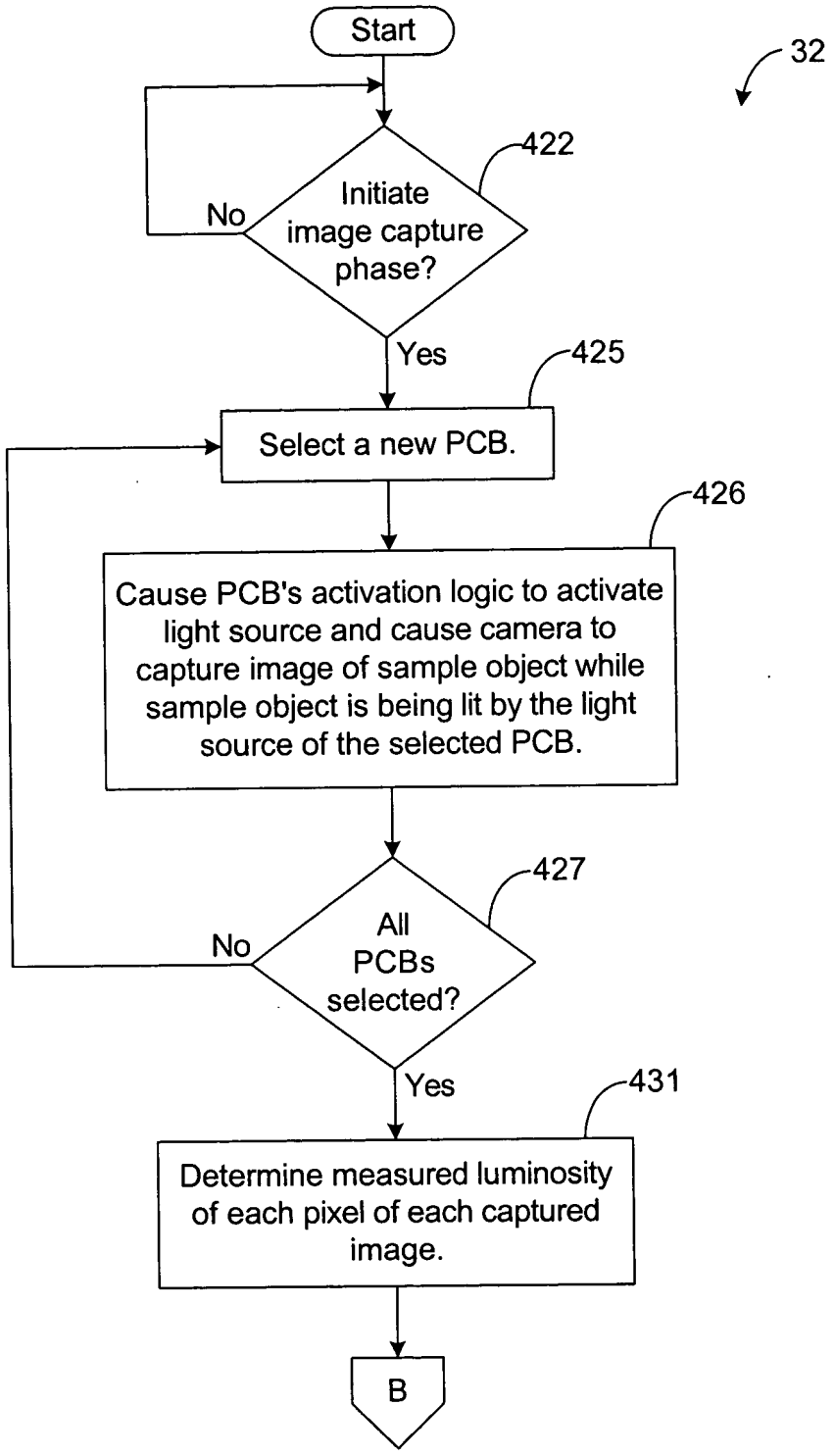

Start
32
422
Initiate image capture phase?
No
Yes
425
Select a new PCB.
426
Cause PCB's activation logic to activate light source and cause camera to capture image of sample object while sample object is being lit by the light source of the selected PCB.
427
All PCBs selected?
No
Yes
431
Determine measured luminosity of each pixel of each captured image.
B

FIG. 13

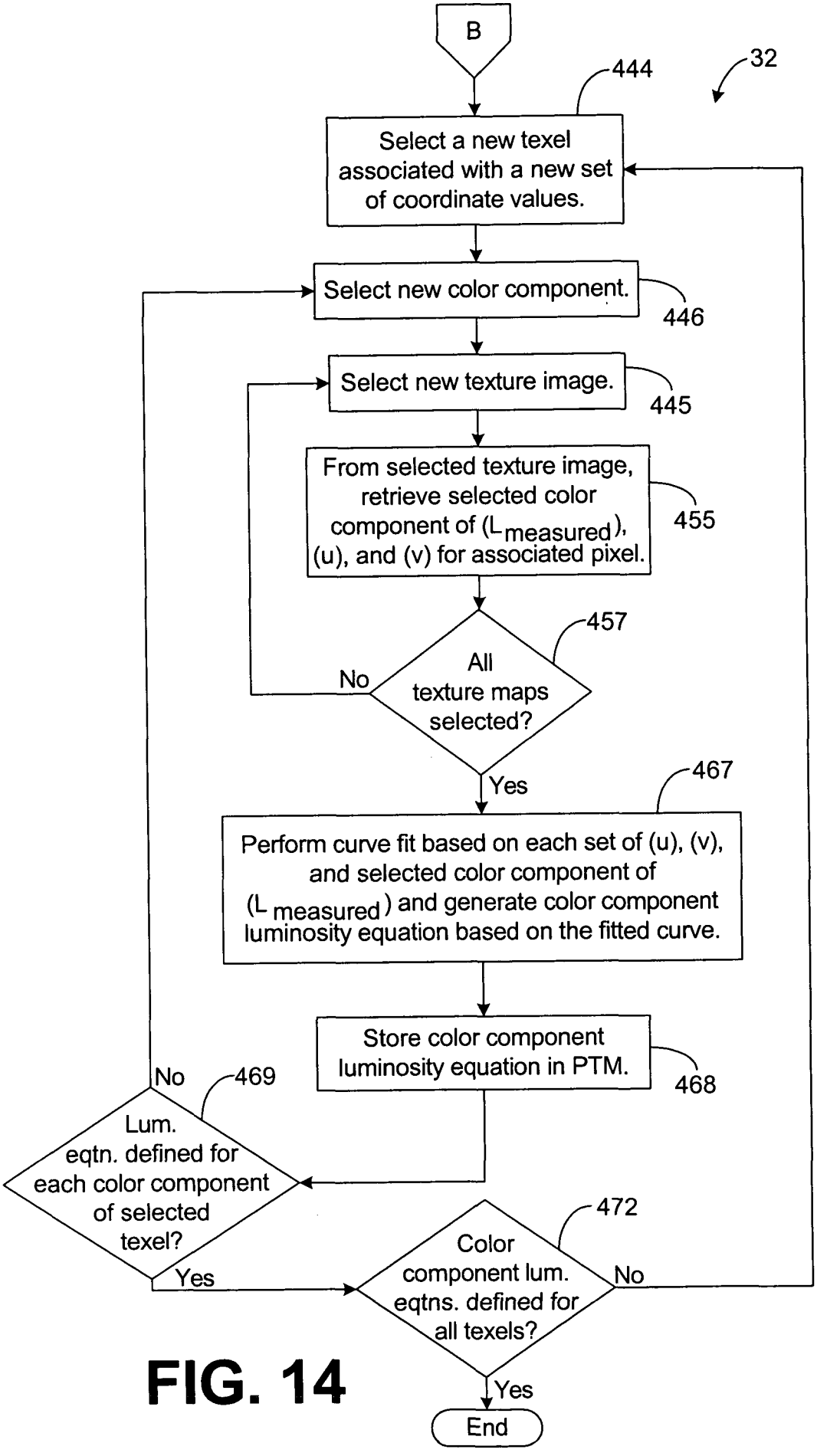

B
32
444
Select a new texel associated with a new set of coordinate values.
Select new color component.
446
Select new texture image.
445
From selected texture image, retrieve selected color component of ($L_{measured}$), (u), and (v) for associated pixel.
455
457
All texture maps selected?
No
Yes
467
Perform curve fit based on each set of (u), (v), and selected color component of ($L_{measured}$) and generate color component luminosity equation based on the fitted curve.
Store color component luminosity equation in PTM.
468
No
469
Lum. eqtn. defined for each color component of selected texel?
Yes
472
Color component lum. eqtns. defined for all texels?
No
Yes
End

FIG. 14

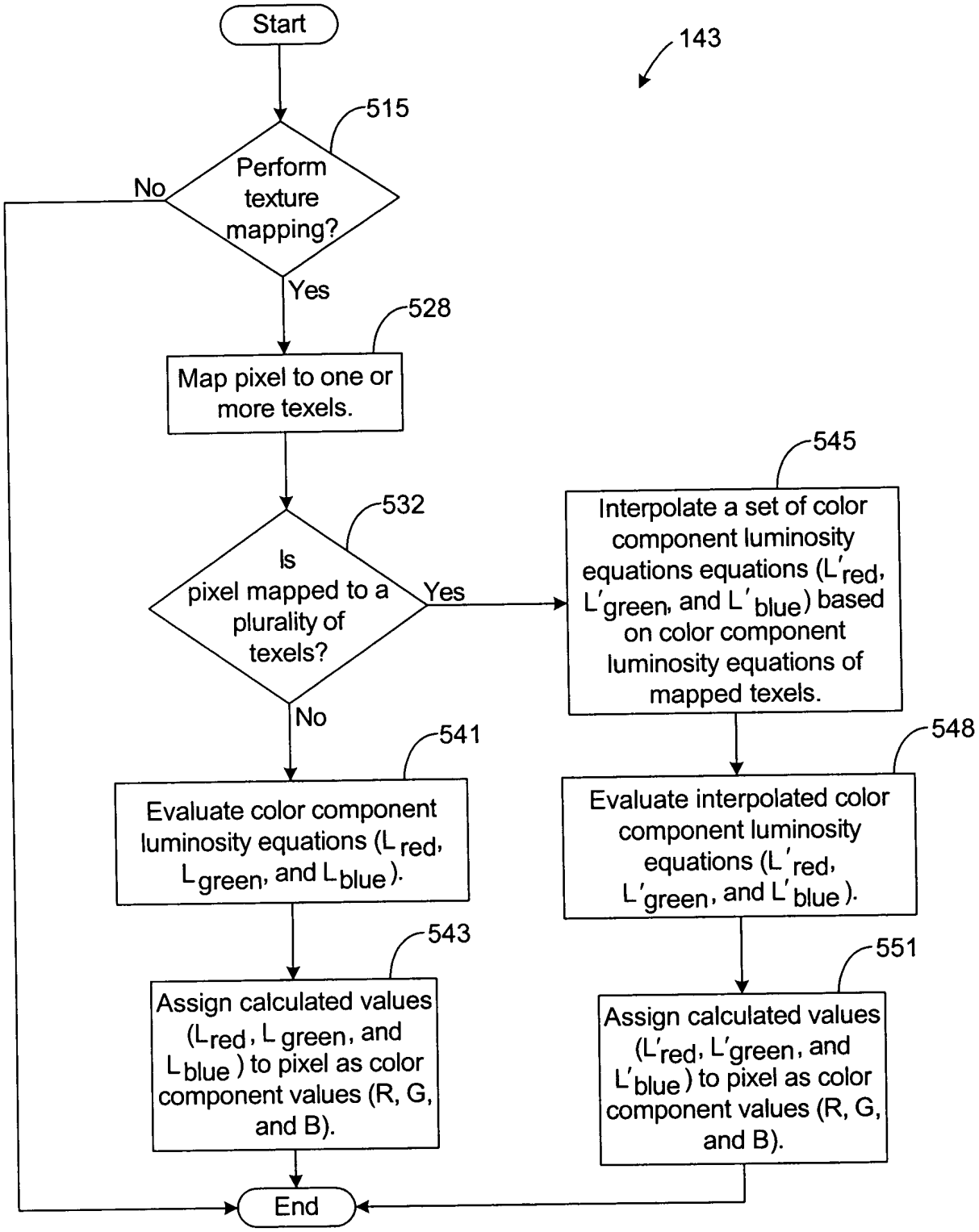

Start
143
515
Perform texture mapping?
No
Yes
528
Map pixel to one or more texels.
532
Is pixel mapped to a plurality of texels?
Yes
No
545
Interpolate a set of color component luminosity equations equations (L'red, L'green, and L'blue) based on color component luminosity equations of mapped texels.
541
Evaluate color component luminosity equations (Lred, Lgreen, and Lblue).
548
Evaluate interpolated color component luminosity equations (L'red, L'green, and L'blue).
543
Assign calculated values (Lred, Lgreen, and Lblue) to pixel as color component values (R, G, and B).
551
Assign calculated values (L'red, L'green, and L'blue) to pixel as color component values (R, G, and B).
End

FIG. 15

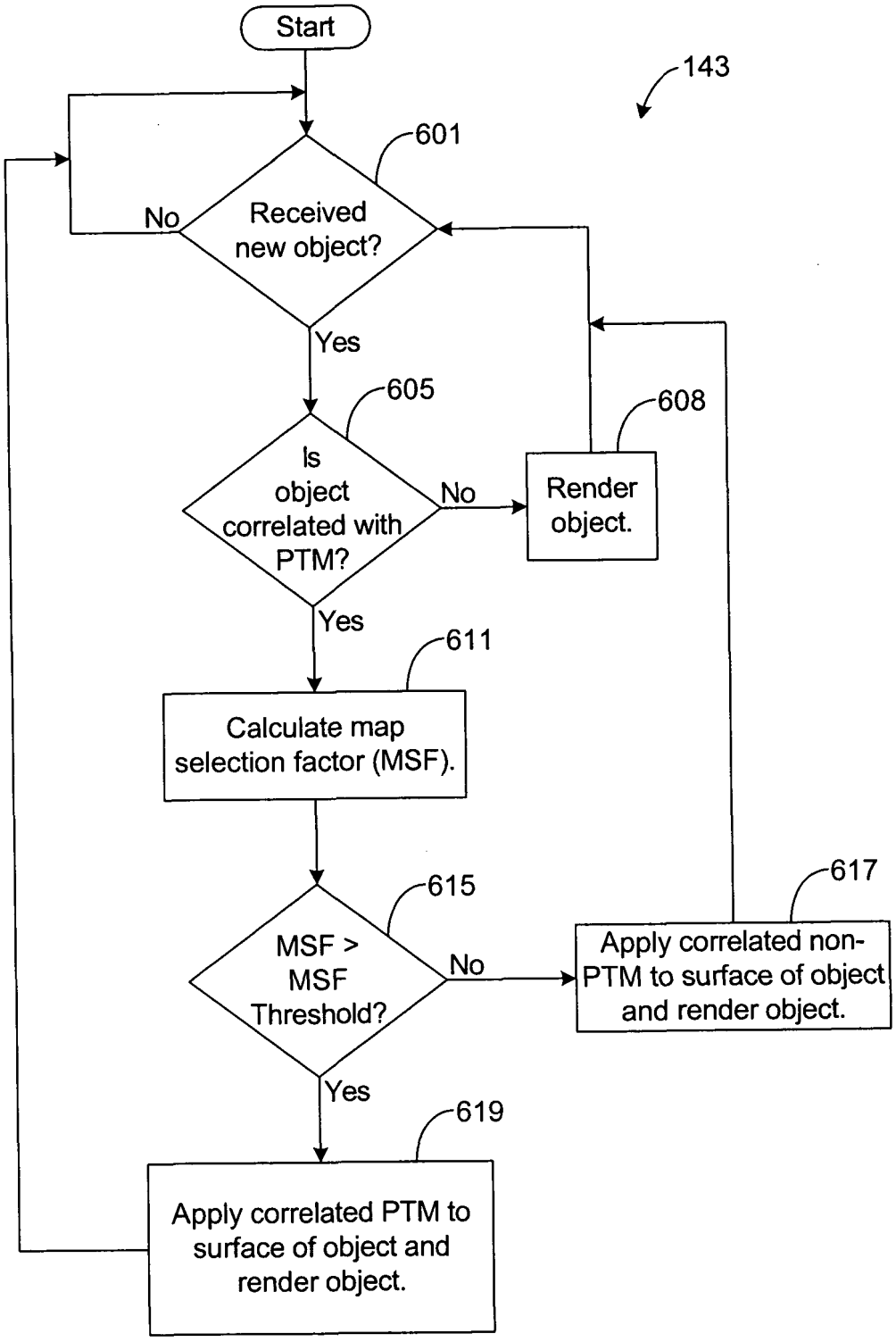

Start
143
601
Received new object?
No
Yes
605
Is object correlated with PTM?
No
608
Render object.
Yes
611
Calculate map selection factor (MSF).
615
MSF > MSF Threshold?
No
617
Apply correlated non-PTM to surface of object and render object.
Yes
619
Apply correlated PTM to surface of object and render object.

FIG. 16

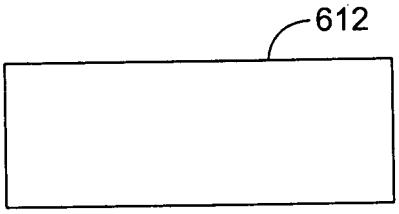
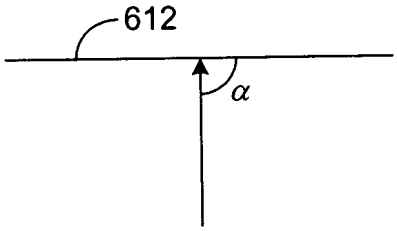
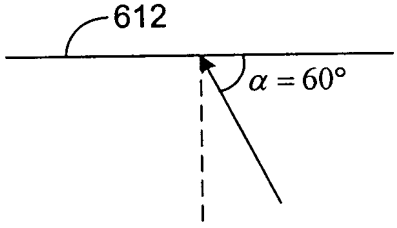


FIG. 17



(Top View)

FIG. 18



(Top View)

FIG. 19